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Qu'est-ce que le raisonnement? Par EUGENIO RIGNANO. *Scientia*, XIII., 1913. pp. 30-57.

In this article the author confines himself to the analysis of certain of the simplest and most common forms of reasoning, reserving for future contributions the study of the evolution of reasoning and the development of its higher forms.

From the analytical study of a series of examples he reaches the conclusion that reasoning consists in the imagined execution of a series of observations or experiences which might have actually been carried out,—e. g., the author, not finding his umbrella in its usual place, thinks momentarily that he may have left it in one of the places where he was on the previous day; but he then reasons that as he did not change his clothing, although it was raining heavily when he came in, this could not have been the case. Here the reasoning is simply the mental representation of a series of experiences, which might have occurred.

In the somewhat different type of geometrical reasoning as, for example, the proof that the sum of the interior angles of a triangle equals two right angles, the actual process of placing the angles in juxtaposition can be carried out by cutting a paper triangle, but is valid only for the particular triangle. Precisely this is accomplished by the imagination. We simply transfer in thought the angles to a common vertex and mentally apply a previous experience to the situation and in making use of an empirical result already obtained we obtain a general value, not obtainable by the actual experiment.

From numerous examples thus analysed, it appears that reasoning is nothing more than a series of representations in thought of operations or experiences either actual or possible.

If the true nature of reasoning is not clearly comprehended, the perfect agreement of the results of the logical process with results actually observed may cause a feeling of surprise and wonder, but if we recognize that the logical process, reasoning, is only a series of experiences, which are all, theoretically at least, susceptible of being carried out but which, in order to save time and energy, are simply limited to the thought, the wonder ceases.

In other words, the intermediary results of all reasoning, even that which develops by means of the most complicated symbolism (to be discussed by the author in a forthcoming paper), have all a concrete symbolism, i. e., they represent the respective empirical results of the different phases which succeed each other in the series of operations or thought experiences.

From this nature of reasoning arise certain advantages and disadvantages. It is evident that in reasoning there is an enormous economy of time and energy as compared with actual carrying out of the experiences.

There are moreover an infinite number of experiences, which though theoretically possible could never be carried out in practice. Reasoning can thus accomplish a far greater number of experiences than would be materially possible and, moreover, can give a more general result as e. g. in the solution of the problem of the value of the interior angles of a triangle.

But there are also disadvantages, which arise from the risk of error which inevitably exists from the very nature of the reasoning process. When the complexity of the process passes a certain limit in consequence of the multiplicity of the experiences mentally accomplished, then it becomes impossible to follow in thought all the factors

and their reciprocal effects which are involved and consequently one or more of them is forgotten. Moreover since we are compelled to use symbols, verbal or otherwise, in our thinking, a source of error is introduced which renders absolute confidence in purely mental results impossible.

But on the other hand, the sterility of pure reasoning affirmed by some authors and the assertion that nothing is contained in the conclusion which was not in the premises is untrue, as may readily be shown by the many new facts in science discovered purely by reasoning. The new combination in the imagination of experiences already known leads to the discovery of absolutely new results, to a new truth which is contained in the combination of facts, but which exists in neither of the facts taken singly. It is this new mental vision created by imagination which constitutes the new fact, the conclusion. But it is also true that though reasoning is quicker and therefore more productive, actual experiment may furnish better conditions for the discovery of new facts, because of the insufficiency of the imagination and because in some cases the observation of all that actually happens gives adequate data.

The fecundity of reasoning depends upon the fact that the imagination is not only reproductive but also productive, i. e., it may combine elements given by experience in a manner entirely different from anything already observed in the past.

For these new combinations the affective intensity directed toward the end to be attained is of supreme importance. An analysis of this dynamic aspect of reasoning shows that it consists in an interest which operates for the exclusion not only of all other affectivities but of memories connected with them. It also directly evokes all memories, facts, experiences, and knowledge associated with the affective tendency which is active throughout the whole reasoning process. But this affective evocation is not sufficient in all, especially in new cases, which must proceed by the method of selecting, from the multiplicity of acts imagined, those particular ones which are suited to the end to be attained. It is precisely this triple form of activity, i. e., exclusion, evocation and selection according to the affective tendency which is the essence of teleological thinking.

Simple association which suffices to explain the evocation and succession of ideas is not adequate to explain the directed association which constitutes reasoning. There is needed in addition the affectivity for the end in order to maintain coherence during a long process of reasoning.

There is also present in the reasoning process a secondary affective tendency which consists in the fear of omitting some of the possible actions and reactions to which the object under consideration might hypothetically be subjected, and this exerts an influence on the process of recall. Illogical thinking is, in fact, due to the forgetting or displacement of some factor necessary to the correct result. This phase of thinking the author proposes to discuss in a future paper on the pathology of reasoning.

THEODATE L. SMITH.

In the Shadow of the Bush. By P. A. TALBOT. New York, G. H. Doran Co.; London, W. Heinemann. 1912. pp. xiv., 500. Price \$5 net.

This book reports the nature and nurture of the Ekoi, a forest or 'bush' people of Southern Nigeria and the Cameroons. The Ekoi